

Science Bowl Questions 1994

Round 8

Toss-Up

1. MATH; Multiple Choice: Which of the following Euclidean geometry postulates would not be true in non-Euclidean geometry?
- a) Any line segment has a congruent counterpart
 - b) Parallel lines always remain the same distance apart
 - c) For any two unique points there is a circle centered at one of the points and passing through the other.
 - d) Two points define a line in space

ANSWER: B – PARALLEL LINES ALWAYS REMAIN THE SAME DISTANCE APART.

Bonus

1. MATH; Short Answer: Given that $y = 5x^3 - 12x^2 + 2x + 6$, what is the value of the second derivative of y with respect to x at $x = 2$?

ANSWER: 36

Toss-Up

2. PHYS; Short Answer: A magnetic device used to force ions to gain energy in ever-expanding circles is called a:

ANSWER: CYCLOTRON (ACCEPT SYNCHROTRON)

Bonus

2. PHYS; Short Answer: Name the physicist who built the first cyclotron in 1930:

ANSWER: (ERNEST) LAWRENCE

Toss-Up

3. BIOL; Multiple Choice: Which of these vertebral structures is only found in mammals?
- a) hemal arch
 - b) postzygapophysis
 - c) centrum
 - d) neural arch

ANSWER: B - POSTZYGAPOPHYSIS

Bonus

3. BIOL; Multiple Choice: If an animal has distinct incisors and molars, what kind of teeth must it have?
- a) homodont
 - b) acrodont
 - c) heterodont
 - d) pleurodont

ANSWER: C - HETERODONT

Toss-Up

4. CHEM; Short Answer: How many atoms of oxygen are in a glucose molecule?

ANSWER: SIX (6)

Bonus

4. CHEM; Multiple Choice: In any chemical reaction, a quantity that decreases to a minimum is:
- a) free energy
 - b) entropy
 - c) temperature
 - d) enthalpy

ANSWER: A – FREE ENERGY

Toss-Up

5. COMP; Multiple Choice: The “Traveling Salesman Problem” is:
- a) P-space complete
 - b) NP complete
 - c) Order n^2
 - d) Undecidable

ANSWER: B – NP COMPLETE

Bonus

5. COMP; Short Answer: If A is a set with N members, how many members does the powerset of A have?

ANSWER: 2 TO THE NTH POWER

Toss-Up

6. BIOL; Multiple Choice: You look at a cell with a microscope and see no organelles. This cell must belong to the kingdom:
- a) Monera
 - b) Fungi
 - c) Protista
 - d) Plantae

ANSWER: A - MONERA

Bonus

6. BIOL; Multiple Choice: Which of these is NOT a syncytium?
- a) hyphae of fungi
 - b) cardiac muscle
 - c) skeletal muscle
 - d) epithelium

ANSWER: D - EPITHELIUM

Toss-Up

7. PHYS; Multiple Choice: Two balls of equal mass are thrown with equal velocities against a massive wall. The first rebounds with a speed equal to its striking speed, and the second sticks to the wall. The impulse that the first ball transmits to the wall, relative to the second, is:
- a) twice as great
 - b) half as great
 - c) the same
 - d) four times as great

ANSWER: A – TWICE AS GREAT

Bonus

7. PHYS; Multiple Choice: When an atom of uranium-235 fissions, the amount of energy released is about:
- a) 1 curie
 - b) 1 picocurie
 - c) 180 Kev
 - d) 180 Mev

ANSWER: D – 180 MEV

Toss-Up

8. CHEM; Short Answer: Hydrocarbons that contain a triple bond between carbon atoms are known as:

ANSWER: ALKYNES

Bonus

8. CHEM; Short Answer: By what type of bond are atoms in a sugar molecule bound?

ANSWER: COVALENT

Toss-Up

9. ASTR; Multiple Choice: Stars that suddenly appear in the sky are known as:
- a) Novas
 - b) Dwarfs
 - c) Black Holes
 - d) Pulsars

ANSWER: A - NOVAS

Bonus

9. ASTR; Multiple Choice: Nova explosions are thought to involve which type of stellar objects?
- a) Cepheid Variables
 - b) Binary stars
 - c) T-Tauri stars
 - d) Herbig-Haro objects

ANSWER: B – BINARY STARS

Toss-Up

10. PHYS; Multiple Choice: A laser of wavelength λ is pointed vertically upward from the earth. At a height h above the earth there will be:
- a) no change in λ
 - b) a slight increase in λ
 - c) a slight decrease in λ
 - d) nothing

ANSWER: B – A SLIGHT INCREASE IN λ (DUE TO GRAVITATIONAL RED SHIFT)

Bonus

10. PHYS; Multiple Choice: if the laser were in a “black hole,” an observer outside the black hole would see:
- a) no change in wavelength
 - b) a slight increase in wavelength
 - c) a slight decrease in wavelength
 - d) nothing

ANSWER: D – NOTHING (NO LIGHT CAN ESCAPE FROM A BLACK HOLE)

Toss-Up

11. CHEM; Short Answer: What term describes the process when a solid phase changes directly to the gas phase?

ANSWER: SUBLIMATION

Bonus

11. CHEM; Short Answer: what is the active ingredient in many common laxatives that is also an acid-base indicator?

ANSWER: PHENOLPHTHALEIN

Toss-Up

12. BIOL; Multiple Choice: If an animal is a gnathostome, it must:

- a) be an invertebrate with mandibles
- b) be a vertebrate with jaws
- c) be a vertebrate without jaws
- d) be an invertebrate with a complete digestive tract

ANSWER: B – BE A VERTEBRATE WITH JAWS

Bonus

12. BIOL; Multiple Choice: An example of morphological color change is:

- a) the change from green to brown in anoles
- b) color change in an alarmed octopus
- c) suntan in humans
- d) blanching in tadpoles

ANSWER: C – SUNTAN IN HUMANS

Toss-Up

13. ERSC; Multiple Choice: At the end of Operation Desert Storm many Kuwaiti oil wells were left blowing out of control and burning. What supplied the force to bring the oil to the earth's surface?
- a) the weight of the rocks above the reservoir
 - b) Hydrostatic Pressure of the oil column
 - c) Capillary action
 - d) The pumps were left running

ANSWER: A – THE WEIGHT OF THE ROCKS ABOVE THE RESERVOIR

Bonus

13. ERSC; Multiple Choice: When a rock is identified as mafic, this means the rock is:
- a) Silicate poor
 - b) Silicate rich
 - c) Magnesium rich
 - d) Magnesium poor

ANSWER: A – SILICATE POOR

Toss-Up

14. CHEM; Short Answer: The structure of an ammonia molecule can best be described as:

ANSWER: PYRAMIDAL (ACCEPT TRIGONAL PYRAMIDAL)

Bonus

14. CHEM; Short Answer: The acid present in ants is:

ANSWER: FORMIC ACID

Toss-Up

15. PHYS; Multiple Choice: Two equal masses travel with equal speeds in opposite directions. They collide in a collision that is between elastic and inelastic. Just after the collision, their velocities are:
- a) zero
 - b) equal to their original velocities
 - c) less in magnitude and in the same direction as their original velocities
 - d) less in magnitude and opposite in direction as their original velocities

ANSWER: D – LESS IN MAGNITUDE AND OPPOSITE IN DIRECTION TO THEIR ORIGINAL VELOCITIES.

Bonus

15. PHYS; Short Answer: A free neutron decays into three particles. Name them.

ANSWER: A PROTON, AN ELECTRON, AND ANTINEUTRINO

Toss-Up

16. BIOL; Multiple Choice: All embryonic vertebrates have a notochord. What is true of adult vertebrates?
- a) all retain the notochord
 - b) None retain the notochord, it is incorporated into the centrium
 - c) Jawless fish retain the notochord; higher vertebrates do not
 - d) All vertebrates except mammals retain the notochord

ANSWER: C – JAWLESS FISH RETAIN THE NOTOCHORD; HIGHER VERTEBRATES DO NOT

Bonus

16. BIOL; Multiple Choice: In birds, the fusion of sacral, trunk, and caudal vertebrae is the:

- a) pygostyle
- b) urostyle
- c) carina
- d) synsacrum

ANSWER: D - SYNSACRUM

Toss-Up

17. CHEM; Short Answer: What is the name given to the non-superimposable mirror image forms of chiral compounds?

ANSWER: ENANTIOMERS

Bonus

17. CHEM; Multiple Choice: How many carbon atoms are there in one naphthalene molecule?

- a) 6
- b) 8
- c) 10
- d) 15

ANSWER: C - 10

Toss-Up

18. MATH; Multiple Choice: For an equation involving only one variable, the maximum number of roots possible is best characterized as:

- a) equal to the sum of all exponents in the equation
- b) equal to the difference between the largest and smallest exponents
- c) greater than the smallest exponent in the equation
- d) less than the largest exponent in the equation

ANSWER: C – GREATER THAN THE SMALLEST EXPONENT IN THE EQUATION

Bonus

18. MATH; Short Answer: What is the value of the sin of 390 degrees?

ANSWER: $\frac{1}{2}$ or .5

Toss-Up

19. ASTR; Multiple Choice: The spectrum of a stellar light source has strong spectral lines of helium and strong spectral lines of neutral metals. The object probably is:
- a) a Type O star
 - b) a binary star system
 - c) a Main Sequence star
 - d) a red giant

ANSWER: B – A BINARY STAR SYSTEM

Bonus

19. ASTR; Short Answer: One clear night you are standing outside and a star having the celestial coordinates of plus 40 degrees declination, 0 hours right ascension, is directly over your head at the zenith at midnight. What time of year is it where you are standing?

ANSWER: THE FIRST DAY OF AUTUMN (AUTUMNAL EQUINOX)

Toss-Up

20. BIOL; Multiple Choice: Which of the following is a sesamoid bone?
- a) patella
 - b) calcaneus
 - c) ethmoid
 - d) atlas

ANSWER: A - PATELLA

Bonus

20. BIOL; Multiple Choice: The archenterons of an embryo is part of which system?
- a) respiratory
 - b) digestive
 - c) nervous
 - d) skeletal

ANSWER: B - DIGESTIVE

Toss-Up

21. GENR; Multiple Choice: New Orleans is exactly one-quarter the distance around the globe from London. In other words, New Orleans is at 90 degrees west longitude. When it is noon in London, what time is it in New Orleans?

- a) Midnight
- b) 6:00 am
- c) 6:00 pm
- d) anytime

ANSWER: B – 6:00 AM

Bonus

21. GENR; Multiple Choice: When is it noon in London, what time is it at the North Pole?

- a) Midnight
- b) 6:00 am
- c) 6:00 pm
- d) anytime

ANSWER: D - ANYTIME

Toss-Up

22. ERSC; Short Answer: What are rocks which have been “altered by change” called?

ANSWER: METAMORPHIC

Bonus

22. ERSC; Multiple Choice: Which of the following rock pairs is a metamorphic match?

- a) Shale & Clay
- b) Limestone & Marble
- c) Granite & Marble
- d) Limestone & Dolomite

ANSWER: B – LIMESTONE & MARBLE

Toss-Up

23. PHYS; Multiple Choice: A 5 kg ball and a 10 kg ball approach each other with equal speeds of 20 meters per second (m/s). If they collide inelastically, the speed of the balls just after the collision is approximately:

- a) 1.0 m/s
- b) 3.5 m/s
- c) 6.7 m/s
- d) 10 m/s

ANSWER: C – 6.7 m/s

Bonus

23. PHYS; Multiple Choice: When the driver of a car in motion applies his brakes, the car slows down. This is due to:

- a) The friction of the brake lining against the rotor or drums only
- b) The friction between the tire and the road
- c) The cut-off of fuel to the engine
- d) Both a and b

ANSWER: D – BOTH A AND B

Toss-Up

24. COMP; Multiple Choice: What type of search best describes the strategy used by most computer programs that play chess?

- a) mini-max
- b) depth-first
- c) binary
- d) breadth-first

ANSWER: A – MINI-MAX

Bonus

24. COMP; Short Answer: One of the most important unsolved problems in computer science is “P = NP”. What do P and NP stand for?

ANSWER: P – POLYNOMIAL TIME; NP – NONDETERMINISTIC
POLYNOMIAL TIME

Toss-Up

25. GENR; Short Answer: Who wrote President Roosevelt in 1939 about the feasibility of an atomic bomb.

ANSWER: ALBERT EINSTEIN

Bonus

25. GENR; Short Answer: What substance did Charles Best and Frederick Banting discover in 1922?

ANSWER: INSULIN
